EXTERNAL PORTS AND CABLES

A video port connects a monitor to a computer using a cable. Video ports and monitor cables transfer analog signals, digital signals, or both. Computers are digital devices that create digital signals. The digital signals are sent to the graphics card where they are transmitted through a cable to a digital display. Digital signals can also be converted to analog signals by the graphics card and transferred to an analog display. Converting a digital signal to an analog signal usually results in lower image quality. A display and a monitor cable that support digital signals should provide higher image quality than those supporting only analog signals. There are several video ports and connector types:

DVI

• Digital Visual Interface (DVI), as shown, has 24 pins for digital signals and 4 pins for analog signals. DVI-I is used for both analog and digital signals. DVI-D handles digital signals only, while DVI-A handles only analog signals.

Displayport
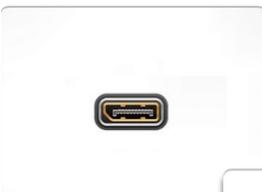
• Displayport, as shown, has 20 pins and can be used for audio, video, or both audio and video transmission.
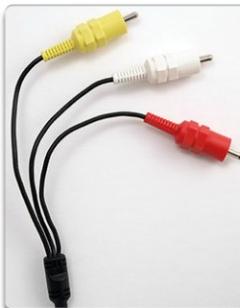
• RCA connectors, as shown, have a central plug with a ring around it and can be used to carry audio or video. It is common to find RCA connectors in groups of three, where a yellow connector carries video and a pair of red and white connectors carry left and right channel audio.

RCA

DB-15

• DB-15, as shown, has 3 rows and 15 pins and is commonly used for analog video.

BNC

• BNC connectors, as shown, connect coaxial cable to devices using a quarter-turn connection scheme. BNC is used with digital or analog audio or video.

- RJ-45, as shown, has 8 pins and can be used with digital or analog audio or video.

RJ-45
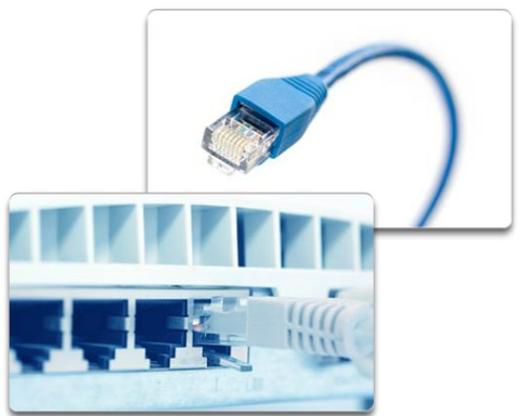
miniHDMI

- MiniHDMI, also called Type C, as shown in Figure 7, has 19 pins, is much smaller than an HDMI connector, and carries the same signals as an HDMI connector.

- Din-6, has 6 pins and is commonly used for analog audio, video, and power in security camera applications.

Display cables transfer video signals from the computer to display devices. There are several display cable types:

- High-Definition Multimedia Interface (HDMI) - Carries digital video and digital audio signals. Digital signals provide high-quality video and high resolutions.

HDMI

DVI

- DVI - Carries analog, digital, or both analog and digital video signals.

- Video Graphics Array (VGA) - Carries analog video signals. Analog video is low quality and can be interfered with by electrical and radio signals.


VGA

Component/RGB

- Component/RGB - Carries analog video signals over three shielded cables (red, green, blue).

Composite

S-Video

Coaxial

Ethernet

- Composite - Carries analog audio or video signals.

- S-Video - Carries analog video signals.

- Coaxial - Carries analog, digital, or both analog and digital video or audio signals.

- Ethernet - Carries analog, digital, or both analog and digital video or audio signals. Ethernet can also carry power.

EXTERNAL PORTS AND CABLES

Input/output (I/O) ports on a computer connect peripheral devices, such as printers, scanners, and portable drives. The following ports and cables are commonly used:

- Serial

- USB

- FireWire

- Parallel

- SCSI

- Network

- PS/2

• Audio

Serial Ports and Cables

A serial port can be either a DB-9 or a DB-25 male connector. Serial ports transmit one bit of data at a time. To connect a serial device, such as a modem or printer, you must use a serial cable. A serial cable has a maximum length of 50 ft (15.2 m).

Modem Ports and Cables

In addition to the serial cable used to connect an external modem to a computer, a telephone cable connects the modem to a telephone outlet. This cable uses an RJ-11 connector, as shown below. A traditional setup of an external modem using a serial cable and a telephone cable is shown below.

Serial Cable and Connector

RJ-11 Telephone and Modem Cable and Connector
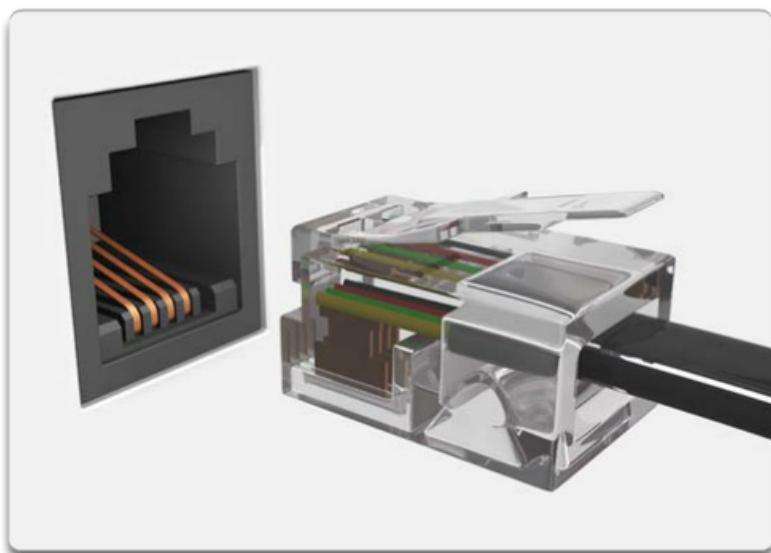
External Modem Using Serial and Telephone Cables
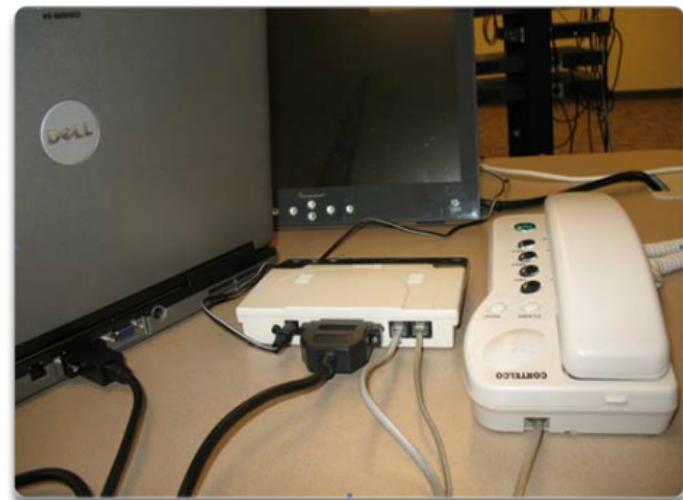
USB Ports and Cables

The Universal Serial Bus (USB) is a standard interface that connects peripheral devices to a computer. It was originally designed to replace serial and parallel connections. USB devices are hot-swappable, which means that users can connect and disconnect the devices while the computer is powered on. USB connections can be found on computers, cameras, printers, scanners, storage devices, and many other electronic devices. A USB hub connects multiple USB devices. A single USB port in a computer can support up to 127 separate devices with the use of multiple USB hubs. Some devices can also be powered through the USB port, eliminating the need for an external power source. Figure 4 shows USB cables with connectors.

USB 1.1 allowed transmission rates of up to 12 Mb/s in full-speed mode and 1.5 Mb/s in low-speed

mode. A USB 1.1 cable has a maximum length of 9.8 ft (3 m). USB 2.0 allows transmission speeds up to 480 Mb/s. A USB 2.0 cable has a maximum length of 16.4 ft (5 m). USB devices can only transfer data up to the maximum speed allowed by the specific port. USB 3.0 allows transmission speeds up to 5 Gb/s. USB 3.0 is backward-compatible with previous versions of USB. A USB 3.0 cable does not have a maximum defined length, although a maximum length of 9.8 ft (3 m) is generally accepted.

USB Cable and Connector

FireWire Ports and Cables

FireWire is a high-speed, hot-swappable interface that connects peripheral devices to a computer. A single FireWire port in a computer can support up to 63 devices. Some devices can also be powered through the FireWire port, eliminating the need for an external power source. FireWire uses the Institute of Electrical and Electronics Engineers (IEEE) 1394 standard and is also known as i.Link. The IEEE creates publications and standards for technology. Figure 5 shows FireWire cables with connectors.

FireWire Cable and Connectors
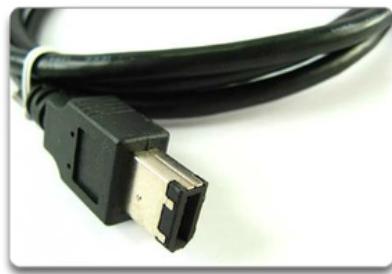
The IEEE 1394a standard supports data rates up to 400 Mb/s for cable lengths of 15 ft (4.5 m) or less. This standard uses a 4-pin or 6-pin connector. The IEEE 1394b and IEEE 1394c standards allow for a greater range of connections, including CAT5 UTP and optical fiber. Depending on the media used, data rates are supported up to 3.2 Gb/s for distances of 328 ft (100 m) or less.

Parallel Cable and Connector

Parallel Ports and Cables

A parallel port on a computer is a standard Type A DB-25 female connector. The parallel connector on a printer is a standard Type B 36-pin Centronics connector. Some newer printers may use a Type C high-density 36-pin connector. Parallel ports can transmit 8 bits of data at one time and use the IEEE 1284 standard. To connect a parallel device, such as a printer, you must use a parallel cable. A parallel cable, as shown in here, has a maximum length of 15 ft (4.5 m).

eSATA Data Cables

The eSATA cable connects SATA devices to the eSATA interface using a 7-pin data cable. This cable does not supply any power to the SATA external disk. A separate power cable provides power to the disk.

50-Pin SCSI Cable and SCSI Connectors

SCSI Ports and Cables

A SCSI port can transmit parallel data at rates in excess of 320 Mb/s and can support up to 15 devices. If a single SCSI device is connected to a SCSI port, the cable can be up to 80 ft long (24.4 m). If multiple SCSI devices are connected to a SCSI port, the cable can be up to 40 ft (12.2 m). A SCSI port on a computer can be a 25-pin, 50-pin, or 80-pin connector, as shown in Figure 7.

25-Pin SCSI Connector

50-Pin SCSI Connector

80-Pin SCSI Connector

NOTE: A SCSI device must terminate at the endpoint of the SCSI chain. Check the device manual for termination procedures.

CAUTION: Some SCSI connectors resemble parallel connectors. Be careful not to connect the cable to the wrong port. The voltage used in the SCSI format may damage the parallel interface. SCSI connectors should be clearly labeled.

Network Ports and Cables

A network port, also known as an RJ-45 port, has 8 pins and connects a computer to a network. The connection speed depends on the type of network port. Standard Ethernet can transmit up to 10 Mb/s, Fast Ethernet can transmit up to 100 Mb/s, and Gigabit Ethernet can transmit up to 1000 Mb/s. The maximum length of network cable is 328 ft (100 m). A network connector is shown on the right.

Network Cable and Connector

PS/2 Cable and Connector

PS/2 Ports

A PS/2 port connects a keyboard or a mouse to a computer. The PS/2 port is a 6-pin mini-DIN female connector. The connectors for the keyboard and mouse are often colored differently, as shown on the left. If the ports are not color-coded, look for a small figure of a mouse or keyboard next to each port.

Audio Ports

An audio port connects audio devices to the computer. Some of the following audio ports are commonly used:

- **Line in** - Connects to an external source, such as a stereo system

- **Microphone** - Connects to a microphone

- **Line out** - Connects to speakers or headphones

- **Sony/Philips Digital Interface Format (S/PDIF)** - Connects to coaxial cable using RCA connectors or fiber-optic cable using TosLink connectors to support digital audio

- **Gameport/MIDI** - Connects to a joystick or MIDI-interfaced device

Audio and Gameport Connectors